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FlashPix
Interoperability Test Suite
User's Manual

Version 1.0

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The *FlashPix*TM format is defined in a specification and a test suite, developed and published by *Eastman Kodak Company* in collaboration with *Hewlett-Packard Company*, *Live Picture Inc.* and *Microsoft Corporation*. Only products that meet the specification and pass the test suite may use the *FlashPix* file format name.

You may email questions and problems to the Developer Support Center at:

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SECTION 1 *Introduction*

1.1 Purpose of the Test Suite

The Interoperability Test Suite is part of the *FlashPix*[™] Reference Software Developer's Kit (SDK). It is intended for developers who write programs that read or write files in the *FlashPix* file format. The Test Suite provides tools for verifying the interoperability of their implementation.

This version of the Interoperability Test Suite validates core *FlashPix* functionality only. It does not address *FlashPix* extensions.

1.2 Defining *FlashPix* Interoperability

As described in Section 1.5, "Format Compliance," of the *FlashPix Format Specification*, the requirements for *FlashPix* compliance are:

- Core *FlashPix* files must contain all required core *FlashPix* data elements and any of the core *FlashPix* optional data elements using only those values enumerated in the core *FlashPix* definition.
- Core *FlashPix* reader implementations must read all valid core *FlashPix* file permutations and take all default actions defined in the core *FlashPix* specification.
- Core *FlashPix* writer implementations write core *FlashPix* files. Every type of *FlashPix* permutation your implementation writes must be tested using the Verifier utility.

The *FlashPix* Interoperability Test Suite provides a set of utilities, test files, and test scenarios that are used to demonstrate interoperability with the specification and other implementations:

- The *FlashPix* Verifier utility checks whether files written by an implementation are valid *FlashPix* files.
- The *FlashPix* Viewer utility supports the viewing of *FlashPix* and TIFF files to demonstrate how a test image should be displayed in a core reader implementation.
- The *FlashPix* test image files are a set of valid *FlashPix* files that provide a thorough set of *FlashPix* file configurations for reader implementation testing and reader/writer testing.
- The *FlashPix* test scenarios provide a series of read/write tests, progressing from the least complicated image rendering to complex image rendering and saving.

1.3 Overview of the Test Tools

1.3.1 *FlashPix* Verifier (Write Test Utility)

The *FlashPix* Verifier utility tests whether files written by a writer are valid *FlashPix* files. This utility checks a file for valid structure and content. It determines whether a *FlashPix* file written by an implementation conforms to the *FlashPix* core specification. It then generates and displays the following data:

- A list of property sets and other structured storage objects.
- Any errors found in the file.
- A summary statement that indicates whether the file is a valid *FlashPix* file.

The Verifier only runs in the *WINDOWS 95* and *WINDOWS NT* environments.

1.3.2 *FlashPix* Viewer (Read Test Utility)

The *FlashPix* Viewer utility tests whether a reader implementation correctly reads *FlashPix* files. It can also be used as a test tool by reading files written by a writer. The Viewer allows you to compare images displayed by a *FlashPix* reader/writer against well-defined benchmarks. Specifically, the Viewer is used in the following ways:

- Visually compare the results of a reader/viewer with results rendered by the Viewer.
- Validate reader rendering and behavior by using the Viewer in conjunction with the supplied test images and Test Suite.
- Build a reader using the Viewer source code as a reference or base (the source code may not be available if you are accessing the Test Suite via the internet.)

The Viewer only runs in the *WINDOWS 95* and *WINDOWS NT* environments.

1.3.3 Test Suite and Test Images

The Test Suite consists of a series of test scenarios that can be used to determine whether an implementation successfully reads and saves a *FlashPix* file.

The test scenarios become increasingly more complex through the test cycle, building upon the success of the previous scenario in that set. The sets within each section of the Test Suite are written to isolate particular permutations and to be used as a unit test for a function change.

Several test images are included as part of the *FlashPix* Interoperability Test Suite. The images contain geometric shapes, tile numbers, and color labeling, among other constructs. The test images are intended to be used in conjunction with the Test Suite, but can also be used alone to test specific image manipulation functions.

1.4 Development Environment

Both the Verifier and the Viewer run on the *WINDOWS 95* or *WINDOWS NT* platforms. If you are using another development platform, you will need to load your *FlashPix* files on a *WINDOWS* system in order to test writers or readers with these tools.

1.5 Manual Organization

This document is organized as follows:

- *Section 2: Reader/Writer Test Tools* describes how to use the Verifier and Viewer utilities to test *FlashPix* writers and readers.
- *Section 3: FlashPix Interoperability Test Scenarios* consists of a series of tests used to determine whether an implementation can successfully read and save *FlashPix* images.
- *Appendix A: Test Images* provides a matrix that describes the properties of the test images used with the Test Suite. For each image, the matrix defines such things as the number of channels, resolution, and whether the results are cached.

1.6 Reference Documents

The Interoperability Test Suite is part of the KODAK *FlashPix* Reference SDK. You are expected to be familiar with the terms, concepts, and structural definition of the *FlashPix* file format. Refer to these other documents for a full understanding of the *FlashPix* format.

- *FlashPix Format Specification*

This manual is the technical specification that defines the image file format for *FlashPix* images. Refer to it for information about file storages and streams, how resolution and color space are handled, and terminology.

- *FlashPix Reference Implementation Programmer's Guide*

This Programmer's Guide is intended for developers who are using the *FlashPix* Reference Implementation. It provides an overview of the Application Programming Interface (API), sample programs, and a command reference of all API functions.

- *FlashPix Implementation Guide*

This manual supplements the *FlashPix Format Specification*. It is a guide for developers who want to use the Reference Implementation to implement the *FlashPix* file format in their applications, as well as for developers who are creating alternative implementations designed to access and manipulate *FlashPix* files.

SECTION 2 *Reader/Writer Test Tools*

2.1 Introduction

The *FlashPix* Interoperability Test Suite provides two utility programs that test whether a file conforms to the *FlashPix* core specification.

***FlashPix* Verifier (Write Test Utility)**

The *FlashPix* Verifier utility tests whether files written by a writer are valid *FlashPix* files. This utility checks a file for valid structure and content. It determines whether a *FlashPix* file written by an implementation conforms to the *FlashPix* core specification. It then generates and displays the following data:

- A listing of property sets and other structured storage objects.
- Any errors found in the file.
- A summary indicating whether the file is a valid core *FlashPix* file, a core *FlashPix* file with extensions, a non-compliant *FlashPix* file, or not a valid *FlashPix* file.

***FlashPix* Viewer (Read Test Utility)**

The *FlashPix* Viewer utility tests whether a reader implementation correctly reads *FlashPix* files. It can also be used as a test tool by reading files written by a writer. The Viewer allows you to compare images displayed by a *FlashPix* reader against well-defined benchmarks. Specifically, the Viewer is used in the following ways:

- Compare the results of a reader/viewer with the results rendered by the Viewer.
- Validate reader rendering and behavior by using the Viewer in conjunction with the supplied test images and Test Suite.
- Build a reader using the Viewer source code as a reference or base (the source code may not be available if you are accessing the Test Suite via the internet.).

2.2 Using the *FlashPix* Verifier

This section describes how to install and run the Verifier, and how to interpret the data it generates. The Verifier must be used to qualify for interoperability. A core *FlashPix* writer implementation writes core *FlashPix* files. Every type of *FlashPix* permutation written by your writer must be tested using the Verifier.

2.2.1 How the Verifier Works

The Verifier checks a *FlashPix* storage file for valid structure and content, as show in the illustration on the following page. The basic verification process is as follows:

1. The Verifier recursively examines *FlashPix* storages and streams associated with an image file, including an audit of each property's values and restrictions as defined in the *FlashPix* specification.
2. It then displays the contents of the *FlashPix* object structure, and optionally copies the data to a file.
3. Finally, the Verifier identifies the tested image file's level of compliance with the *FlashPix* specification.

2.2.2 Installing the Verifier

The following instructions assume you have the Test Suite on CD. If you are accessing the Test Suite via the internet, refer to the instructions displayed at the internet site.

To install the Verifier, place the *FlashPix* CD-ROM into the drive, and access the directory:

```
test_ste\verifier
```

Copy this directory to your hard disk.

2.2.3 Running the Verifier

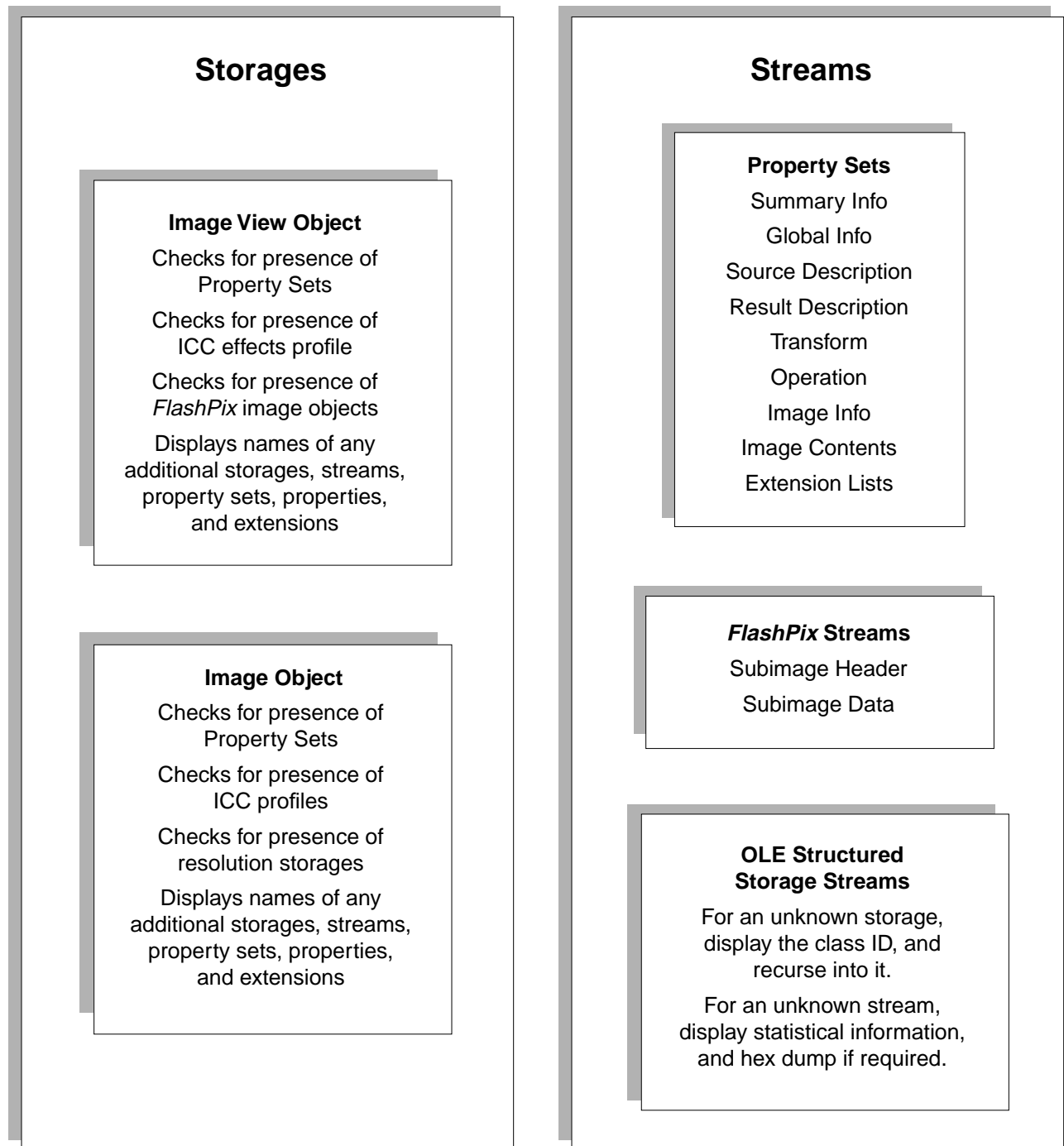
The Verifier runs from the DOS command line. In a DOS box running under *WINDOWS 95* or *WINDOWS NT*, go to the Verifier directory and type:

```
fpvfy [level] <FlashPiximage> [OutputFile]
```

where:

- `level` is an optional parameter that lets you specify the verification level (as described in Table 2.1).
- `FlashPiximage` is the name of the image file to be tested.
- `OutputFile` is the name of an optional file that contains a copy of the screen output.

FIGURE II.1

FlashPix Objects Checked by Verifier

Setting the Verification Level

The optional `level` argument provides control over the verification process and the type of output that is generated by specifying which properties will be checked.

The `level` argument is expressed as a number in the range 0 through 7. If the `level` argument is omitted, the default value is 5. If the first command line parameter begins with a number, it is assumed to be the `level` argument, so it is suggested you do not begin a *FlashPix* filename with a digit.

Note:

You must use at least the default level of 5 to qualify for interoperability.

The following table shows the eight options of the `level` argument, and the parameters checked by each option.

TABLE 2.1

Verifier Level Options

Level	Name	Class ID	Type	Value	Verify	Compress	Hex
0	yes						
1	yes	yes					
2	yes	yes	yes				
3	yes	yes	yes	yes			
4	yes	yes	yes	yes	yes		
5	yes	yes	yes	yes	yes	yes	
6	yes	yes	yes	yes	yes	yes	yes
7	Checks all parameters						

Description of Optional Parameters

Name	Display the field names
Class ID	Display the class ID
Type	Display type
Value	Display value, or enum mnemonic
Verify	Perform most verify tests - not image
Compress	Decompress image tiles
Hex	Display hex dump of value

Checking Multiple Files

The Verifier can only check a single file at a time. You can test multiple *FlashPix* files by using DOS batch commands to create a batch file that repeatedly invokes the Verifier.

2.2.4 Interpreting Verifier Output

The Verifier displays the names of storages, streams, and properties that are present in the *FlashPix* view object and image object. Refer to the *FlashPix Format Specification* document for a complete list of object types and valid storage structures.

Error Conditions

Normal values detected by the Verifier are displayed in an indented format. If an error is detected, it is displayed left-justified to be more readily visible. The error message displays the cause of the error condition and the expected value (if applicable). Any information that cannot be read by the Verifier is displayed as hexadecimal.

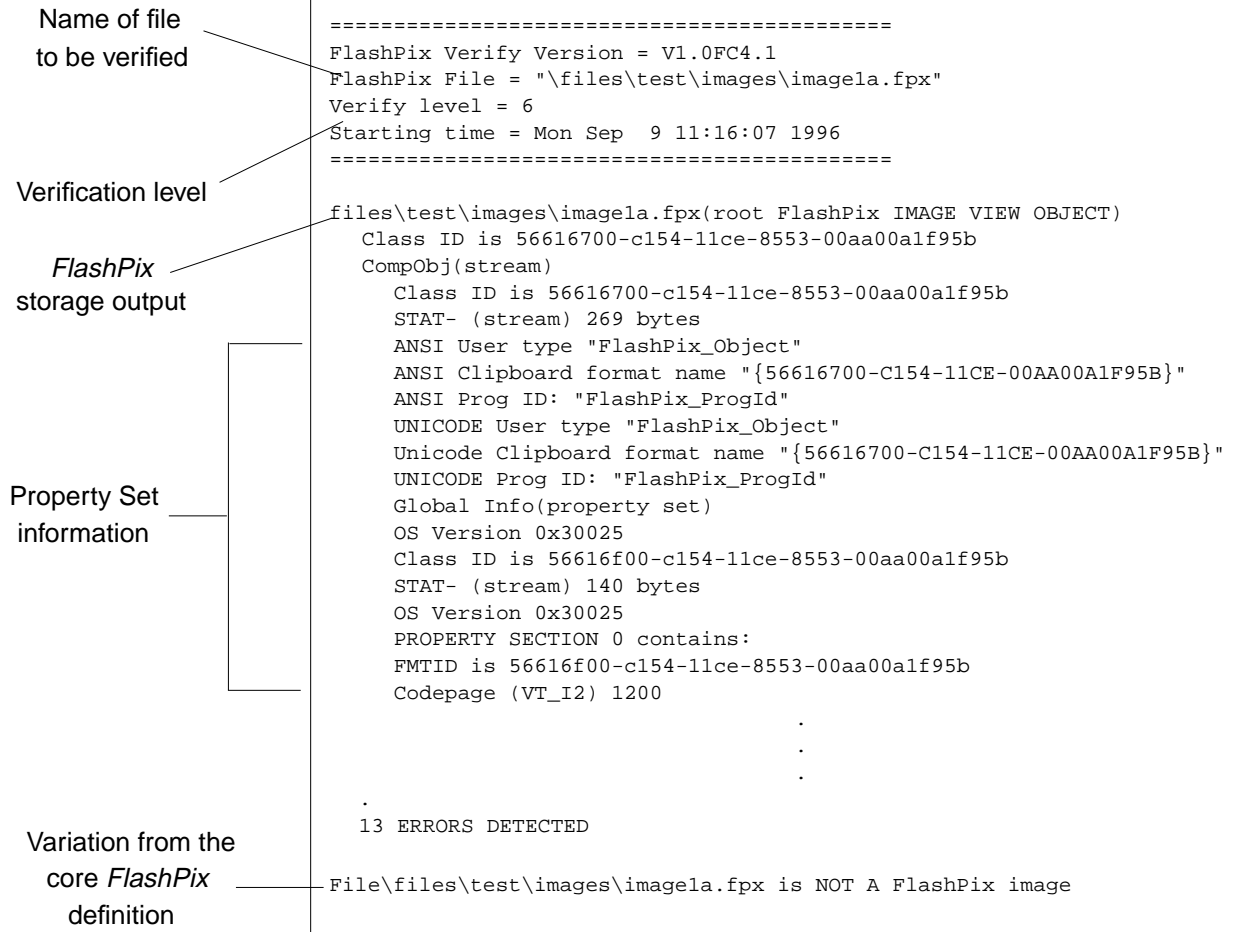
Conformance Summary

At the bottom of the output, the Verifier displays the number of errors and the degree of conformance to the *FlashPix* specification:

- *Core FlashPix File*
If the image meets the minimum requirements for a *FlashPix* image, it is defined as a *Core FlashPix* file.
- *Extended FlashPix File*
If the image meets the minimum requirements of a *Core FlashPix* file, but contains additional image information, it is defined as an *Extended FlashPix* file.
- *Non-Compliant FlashPix File*
If the image meets the minimum requirements of a *Core FlashPix* file, but contains additional image information that is not supported, it is defined as a *Non-Compliant FlashPix* file.
- *Not a FlashPix file*
If the image fails to meet the minimum definition of a *FlashPix* file, the message “*Not a FlashPix file*” is displayed.

FIGURE II.2

Format of Verifier Output



2.3 Using the *FlashPix* Viewer

This section describes how to install and run the Viewer, and how to open, compare, and manipulate multiple test images. The Viewer utility provided with the Interoperability Test Suite must be used to qualify for interoperability.

2.3.1 Installing the Viewer

The following instructions assume you have the Test Suite on CD. If you are accessing the Test Suite via the internet, refer to the instructions displayed at the internet site.

To install the Viewer, place the *FlashPix* CD-ROM into the drive, and go to the directory:

```
test_ste\viewer
```

This directory contains the following subdirectories and files:

Directory Description	File Description
\bin	Viewer executable and associated DLL files.
\src	Viewer source files, which may be used as a reference or base for creating a new reader.

Copy these directories to your hard disk.

Note:

The Viewer source files may not be available if you are accessing the Test Suite via the internet.

2.3.2 The Viewer Test Process

Note:

The Viewer utility provided with the Interoperability Test Suite must be used to qualify for interoperability.

Typical Use of the Viewer

The basic procedure for using the Viewer is as follows:

1. Read and render the test images using your *FlashPix* reader.
2. Open the same test image using the Viewer utility.
3. Compare the two images, taking into account environmental differences (such as gamma correction variances and other differences between monitors and other output devices.)
4. Using the supplied test images and test scenarios, perform the Test Suite to determine the robustness and interoperability of your reader/writer.

If Your Reader Cannot Display *FlashPix* Files

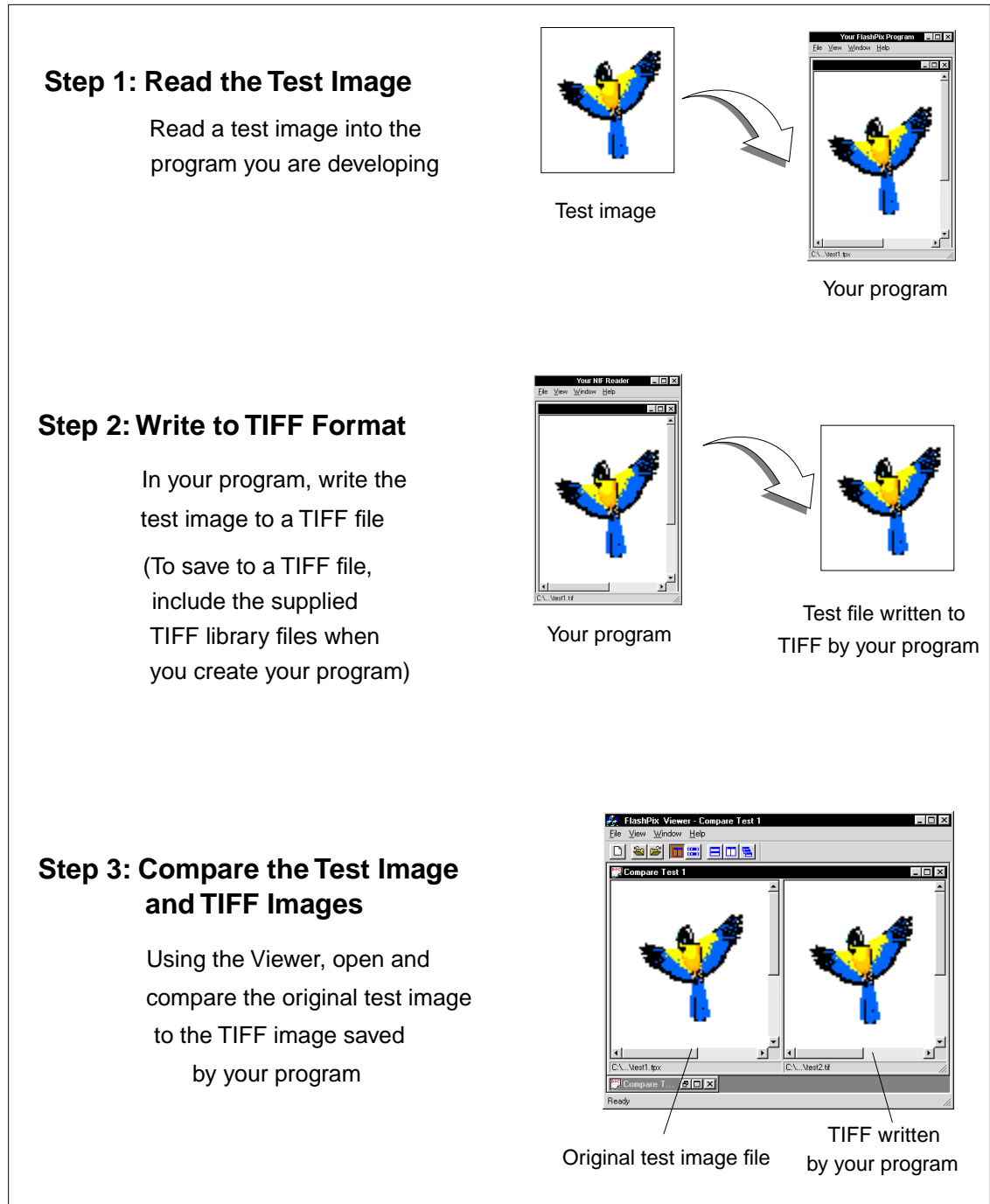
If the reader you are developing does not have the capability of displaying images, you will not be able to use the Viewer in the manner described above.

However, you can still use the Viewer by saving the *FlashPix* file to a neutral file format (TIFF format), using the following procedure:

1. When you compile your *FlashPix* reader, include the TIFF libraries supplied with the Test Suite. This will allow you to write the *FlashPix* image to a TIFF file. (These TIFF libraries only run on the *WINDOWS 95* or *WINDOWS NT* platforms.)
2. Using your reader, write the *FlashPix* image to a TIFF file. If you use a development platform other than *WINDOWS 95* or *WINDOWS NT*, transfer your file to a *WINDOWS* system.
3. Run the Viewer, and open the original *FlashPix* image in one pane of the View window.
4. In the other View window pane, open the TIFF file saved by your reader. The two images appear side by side. Any differences between the images should be apparent.

FIGURE II.3

Using the Viewer When a Reader Cannot Display Images



2.3.3 Running the Viewer

The Viewer executable is named *fpviewer.exe*. Run it by double-clicking on the filename in Explorer or File Manager, or by creating an icon and double-clicking on it.

2.3.4 Opening Images in the View Window

The Viewer uses standard Windows conventions to open image files. However, because the Viewer can launch and display a number of images concurrently, there are several unique options that allow you to open images. These options are described below.

Opening a New View Window

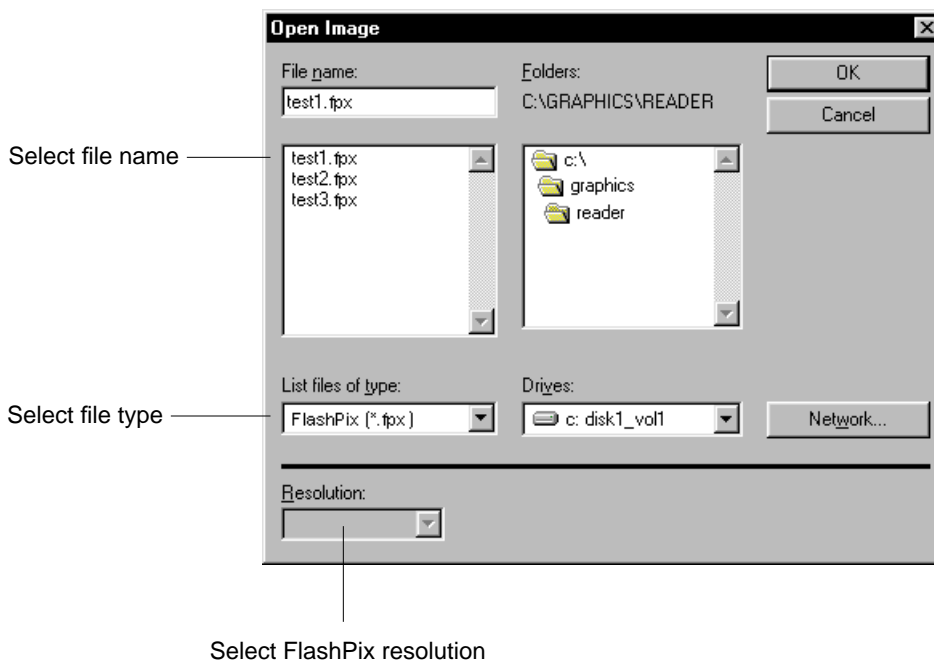
To open a new View window, you can either:

- Click the New icon on the Toolbar, or
- Choose File->Open from the menu.

The Open Image dialog box appears. Select the file you want to open from the list box.

FIGURE II.4

Viewer Open Dialog Box



Selecting the File Type

Use the File Type drop-down box to specify whether you are opening a *FlashPix* image or a TIFF image.

Changing the Resolution of a *FlashPix* File Before Loading It

If you changed the resolution of the *FlashPix* image before you saved it as a TIFF file in your writer, you will need to apply the same resolution to the original *FlashPix* file when you load it for comparison.

Click the Resolution drop-down box to open the *FlashPix* file at a different resolution.

Opening a Second Image in Dual-Pane View

To open a second image in the View window, you can either:

1. Click the Toggle Pane View icon on the toolbar.
The View window splits into two panes.
2. Click the Insert Image Right icon on the toolbar.
The Open Image dialog box appears. Select the file in the list box you want to open.

Other File Open Options

There are several alternative ways to open image files, depending on whether you currently have open images. Choose the method that best suits your work habits:

- Clicking the Insert Image Left/Insert Image Right icon on the toolbar allows you to open a new image in either the left or right View window pane.
- Choosing File->Open->Insert Image Left/Insert Image Right from the menu also allows you to open a new image in either the left or right View window pane.
- Double-clicking directly on an open image pane displays the File Open dialog box.
- Clicking the secondary mouse button in a window pane brings up a pop-up menu. This menu lets you insert and close images, as well as toggle the synchronized scrolling feature, and change the background color of the Viewer main window.

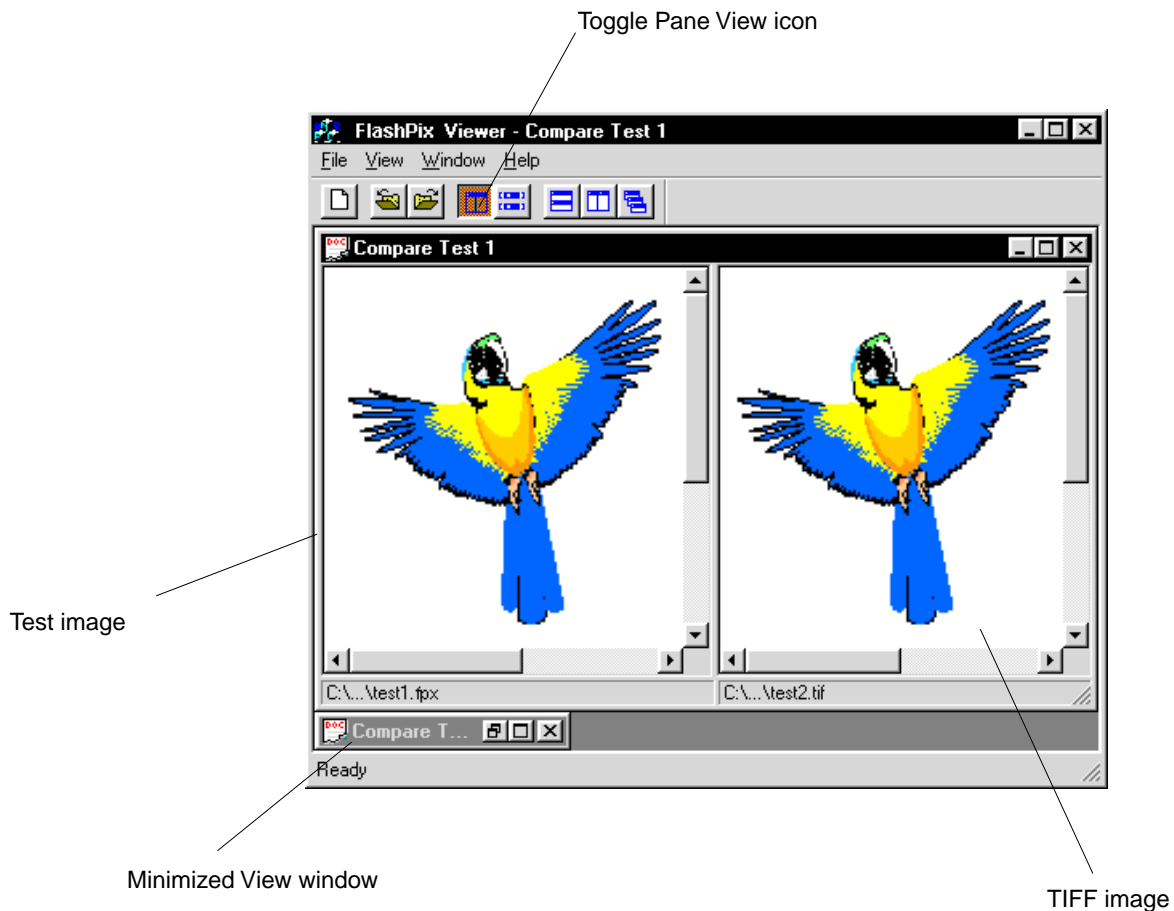
2.3.5 Viewing Files

The Viewer allows you to compare two images, side by side, in a single window. The View window has two independent panes that can be manipulated individually or scrolled in unison. The Viewer also conforms to the Microsoft Multiple Document Interface (MDI). You can open several windows at once and view them, tile or cascade them, or minimize them.

Toggle between Single-Pane and Dual-Pane Mode

To toggle a View window between single-pane and dual-pane view, click the Toggle Pane View icon on the Toolbar.

FIGURE II.5 View Window, Dual-Pane Mode



Synchronized Scrolling

The Viewer includes an optional form of scrolling called synchronized scrolling. Synchronized scrolling allows you to scroll both panes in the View window at once by using scroll bars from either window. This feature allows you to visually compare two images easily and thoroughly.

This feature can be enabled or disabled by selecting the Synchronize Scrolling option under the View menu or by clicking the Synchronized Scrolling button on the toolbar. Synchronized scrolling is automatically disabled if the images are not of equal size.

Managing Multiple Image Files

Using the menu, toolbar, or standard window buttons, you can organize open windows in any of the following ways:

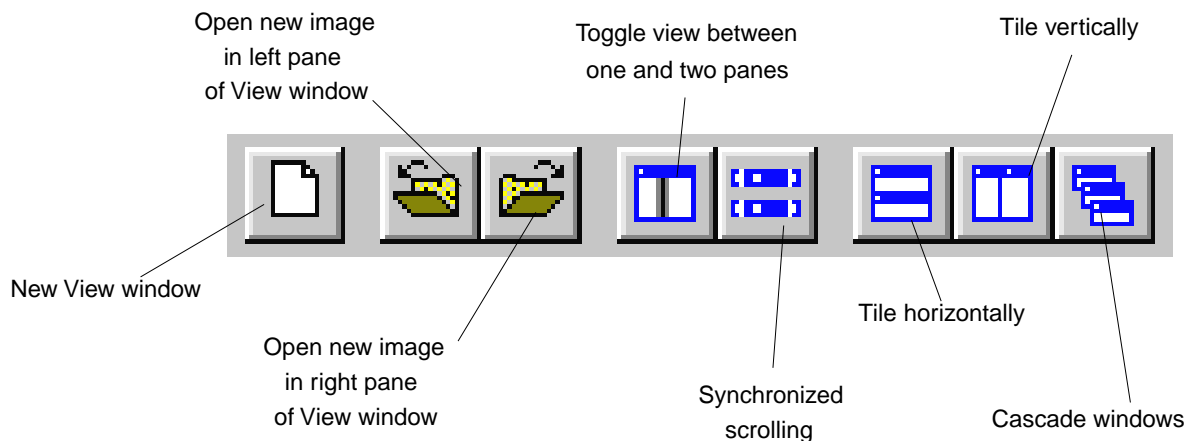
- Horizontally Tile all windows (menu, toolbar)
- Vertically Tile all windows (menu, toolbar)
- Cascade all windows (menu, toolbar)
- Minimize windows (using the Minimize button at the top-right of the window)
- Arrange minimized window icons (menu only)

2.3.6 Using the Toolbar

The easiest way to access the Viewer's features is to use the toolbar. The status bar at the bottom of the screen displays the purpose of a toolbar button when the cursor is placed over it.

FIGURE II.6

Viewer Toolbar



SECTION
3

*FlashPix Interoperability
Test Scenarios*

3.1 Understanding the Test Process

The *FlashPix* Interoperability Test Suite provides a set of utilities, test image files, and test scenarios that are used to demonstrate interoperability with the *FlashPix* specification and other implementations.

The tests become increasingly complex through the test cycle, and are designed to be initially executed in order because each builds upon the success of the previous test. The tests within each section are written to isolate particular permutations and to be a unit test for a function change. Erroneous test images are not provided.

3.1.1 Test Suite Components

The Interoperability Test Suite consists of the following tools:

- The *FlashPix* Verifier utility checks whether files written by an implementation are valid *FlashPix* files.
- The *FlashPix* Viewer utility supports the viewing of *FlashPix* and TIFF files to demonstrate how a test image should be displayed in a core reader implementation.
- The *FlashPix* test image files are a set of valid *FlashPix* files that provide a thorough set of file configurations for reader/writer implementation testing. The images contain geometric shapes, tile numbers, and color labeling, among other constructs.
- The *FlashPix* test scenarios on the following pages provide a series of tests that must be performed to ensure interoperability. The tests are not in one-to-one correspondence with the number of images available, but a specific image (or its resolution's subimage data) can be mapped to an appropriate test.

- A test image matrix combined with these scenarios determines the collection of tests to be performed. The matrix represents the type of *FlashPix* file to be verified along with the valid core file permutations for each type. See Appendix A for the matrix.

3.1.2 What Needs to be Tested

Determining a Successful Read Operation

Core *FlashPix* reader implementations must read all valid core *FlashPix* file permutations and take all default actions defined in the core *FlashPix* specification.

If you are developing a *FlashPix* reader, you must perform the read tests on the following pages, including the file writing tests if your implementation is also a writer.

The definition of a successful read operation is specific to each test, and the expected results are shown in the “Successful Read Test Results” section of each test description.

Determine a Successful Write Operation

Core *FlashPix* writer implementations writes core *FlashPix* files. Every type of *FlashPix* permutation your implementation writes must be tested using the Verifier utility.

If your implementation is a writer only, use the Verifier as described in Section 1.

If you are developing a *Flashpix* reader/writer (an implementation that can perform save, save as, or copy operations), you must perform two write tests using the Verifier utility:

- A simple write of a test image to the *FlashPix* format and checking it with the Verifier utility for errors.
- Making viewer-parameter modifications to the image file, writing it, and checking it with the Verifier utility for errors.

The Verifier checks for the presence of required core *FlashPix* properties as well as optional properties that may be present and are valid under the *FlashPix* specification. A write operation is successful if it passes the Verifier test without returning errors. Any warning messages returned by the Verifier should be closely examined.

3.1.3 Sample Test

The remainder of this chapter contains the tests which comprise the *FlashPix* Interoperability Test Suite. The following sample shows the format of a typical test and how to use it.

Sample Interoperability Test

Run these tests
to confirm
FlashPix
compliance

Purpose	This box describes the reason for conducting the test, and what specific file characteristics will be tested.
Source Image	This column shows the name of the test image used to conduct the test.
①	Successful Read Test Results
This box specifies the expected results of a read test. Typically, it is based on visual appearance as seen using the <i>FlashPix</i> viewer, and by comparison to an associated TIFF file.	
②	Successful Write Test Results
This box defines what constitutes a successful write operation. Typically, it means passing the <i>FlashPix</i> Verifier test without errors. Both this test and the following test are required to ensure the ability to write <i>FlashPix</i> files.	
③	Successful Write of Modified Image
This box defines what constitutes a successful write operation after modifications have been made to viewing parameters of a test image. Typically, it means passing the <i>FlashPix</i> Verifier test without errors. Both this test and the previous test are required to ensure the ability to write <i>FlashPix</i> files.	

3.2 Part 1: Transformless Images

This section of the Test Suite allows you to test the following image manipulation and rendering features:

- Simple image display with correct tile assembling.
- Initial color space handling.
- All valid input color channel configurations with and without compression.
- Write tests ensure the implementation's ability to generate valid *FlashPix* files.

3.2.1 Tile Order/Tile Boundary/NIFRGB Color

Purpose of Tests

Test construction of a simple NIFRGB image from tiles, regardless of the tile order. Test writing simple core NIFRGB images.

Successful Completion of Read Tests

- Generally, property sets can be read. Structured Storage files can be manipulated.
- Some level of binary compatibility with OLE Structured Storage is achieved.
- Property sets associated with Image 1 can be read. Critical properties are extracted.
- Transformless *FlashPix* images can be read.
- 3-channel image data is correctly extracted.
- Uncompressed NIFRGB tiles and the color space can be correctly processed. Tile compression type \$0 is correctly processed.
- Simple Subimage Resolution Storages are correctly processed.
- Tile Header Table, data streams, and tiles are correctly processed.
- Core reader handles legacy codepage values for the Summary Information Property Set.
- Optional core *FlashPix* streams do not negatively affect functionality.

Note:

This test scenario uses images from Image Sets 1, 2, and 3 as input. The content of these images is highly specialized. Each resolution has been constructed using different content, because the tiles are numbered within each resolution. For more information, refer to the associated text files, located in the same directory as the test images.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Any warning messages returned by the Verifier should be closely examined.

TEST 1

Resolution Retrieval, Tile Assembly, Tile Boundary

Purpose	General I/O; image display; resolution retrieval. Test tile assembling, tile ordering, tile boundaries.
Source Image	Image 1A.
Successful Read Test Results	Image appears correct. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image even when tiles are out of order.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

3.2.2 Simple Decompression of RGB Tiles

Purpose of Tests

Test simple decompression capabilities using 3-channel NIFRGB image data. Write tests ensure the implementation's ability to generate valid *FlashPix* files.

Successful Completion of Read Test

- Simple JPEG support for NIFRGB color space.
- Simple color rotation is correctly managed.
- 3-channel image data is extracted from compressed tiles, decompressed when necessary, and correctly rendered.
- Compression Information Group properties are read and used correctly.
- Subimage Resolution Storages are managed in conjunction with the respective compression options.
- Tile Header Table, data streams, and tiles are correctly managed.
- Different compression options are correctly managed.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Any warning messages returned by the Verifier should be closely examined.

TEST 1**Simple Decompression of NIFRGB**

Purpose	Recognition of compression. Simple decompress of same color space with same number of channels.
Source Image	Image 1B.
Successful Read Test Results	Image appears correct. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image. Tile compression type \$2 is recognized. 3-channel image supported.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 2**Simple Decompression of NIFRGB - No Color Rotation**

Purpose	Recognition of compression. Simple decompress of same color space, same number of channels. Recognize no default color rotation internal to JPEG.
Source Image	Image 1D.
Successful Read Test Results	Image appears correct. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

3.2.3 NIFRGB Plus Opacity Color Space

Note:

If compositing, the background color under the opacity area is implementation-specific, and therefore may vary from the TIFF image.

Purpose of Tests

- Test reading of NIFRGB plus opacity image data.
- Test decompression capabilities using NIFRGB plus opacity image data.
- Write tests ensure the implementation's ability to generate valid *FlashPix* files.

Successful Completion of Read Test

- Property sets for Image 2 can be read. Critical properties are correctly extracted.
- Simple color rotation is correctly managed.
- 4-channel image data is extracted from compressed tiles, decompressed when necessary, and correctly rendered.
- NIFRGB plus opacity channel is extracted from compressed tiles, decompressed, and correctly rendered.
- Premultiplied opacity is correctly handled during decompression and color rotation.
- Compression Information Group properties are read and used correctly.
- Subimage Resolution Storages are managed with compression options.
- Tile Header Table, data streams, and tiles are correctly managed.
- Uncalibrated data settings do not negatively affect core reader (Test image 2E).

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Any warning messages returned by the Verifier should be closely examined.

TEST 1**NIFRGB Plus Opacity Color Space**

Purpose	Read a different color format: NIFRGB plus opacity channel. Compression is not involved.
Source Image	Image 2A.
Successful Read Test Results	Image appears correct. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 2**Decompression of NIFRGB Plus Opacity Color Space**

Purpose	Validate NIFRGB plus opacity color format and correctly decompress and assemble the tiles.
Source Image	Image 2B.
Successful Read Test Results	Image appears correct. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 3**Embedded Table Data**

Purpose	Validate NIFRGB plus opacity format, correctly decompress and assemble the tiles, regardless of table location. Table data is embedded in the tiles.
Source Image	Image 2D.
Successful Read Test Results	Image appears correct. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 4**Uncalibrated Color Data Settings**

Purpose	Validate reading of images with uncalibrated color data settings.
Source Image	Image 2E.
Successful Read Test Results	Image appears correct. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

3.2.4 PhotoYCC Colorspace With and Without Opacity

Purpose of Tests

- Test read/write capabilities for *FlashPix* image data.
- Test decompression capabilities using PhotoYCC without opacity image data.
- Test decompression capabilities using PhotoYCC with opacity image data.

Successful Completion of Read Test

- Image 3 property sets can be read. Critical properties are correctly extracted.
- PhotoYCC color space has been managed.
- 3-channel PhotoYCC and PhotoYCC plus opacity image data are extracted from compressed tiles, decompressed when necessary, and correctly rendered.
- Premultiplied opacity is correctly handled during compression and color rotation.
- Compression Information Group properties are correctly read and used.
- Subimage Resolution Storages are managed with respective compression options.
- JPEG library manages PhotoYCC data.
- Tile Header Table, data streams, and tiles are correctly managed.
- Non-image data can be read.
- Core reader correctly handles Summary Information property set = 1252.
- Optional *FlashPix* Property Set properties are maintained as directed.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Any warning messages returned by the Verifier should be closely examined.

TEST 1**PhotoYCC**

Purpose	Validate PhotoYCC color format and assemble tiles.
Source Image	Image 3A.
Successful Read Test Results	Image appears correct and matches TIFF image. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image. The visual data obtained will look like the contact sheet image entitled "PXTRY (RGB converted pixel values)."
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 2**PhotoYCC Compressed**

Purpose	Validate PhotoYCC color format and correctly decompress and assemble the tiles.
Source Image	Image 3B.
Successful Read Test Results	Image appears correct and matches TIFF image. Lettered blocks are correct. Correct resolution is retrieved. Tiles are correctly assembled into an image. The visual data obtained will look like the contact sheet image entitled "PXTRY (RGB converted pixel values)."
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 3**PhotoYCC Complex Decompression**

Purpose	Validate PhotoYCC color format and decompress and assemble the tiles. Validate reading of mixed compression options across resolutions.
Source Image	Image 3C, each resolution.
Successful Read Test Results	Image appears correct. Correct resolution is retrieved. Tiles are correctly assembled into an image. Higher resolutions are decompressed, and lower resolutions that are not compressed are correctly managed. Visual data obtained will look like the contact sheet image entitled "PXTRY (RGB converted pixel values)." Non-image data is available.
Successful Write Test Results	Passes Verifier test without errors, and non-image data is properly managed. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 4**PhotoYCC plus Opacity**

Purpose	Validate PhotoYCC plus opacity color format and correctly decompress and assemble the tiles.
Source Image	Image 4.
Successful Read Test Results	Image appears correct. Correct resolution is retrieved. Tiles correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

3.2.5 Monochrome Colorspace With and Without Opacity

Purpose of Tests

- Test read/write of monochrome image data with and without opacity.
- Test decompressing monochrome image data.

Successful Completion of Read Test

- Single-channel monochrome image data is extracted reasonably.
- Monochrome and opacity image data is extracted reasonably.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Any warning messages returned by the Verifier should be closely examined.

TEST 1

Uncompressed Monochrome

Purpose	Validate uncompressed monochrome format and assemble the tiles.
Source Image	Image 5.
Successful Read Test Results	Image appears correct. Correct resolution is retrieved. Tiles are correctly assembled.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 2

Decompression of Monochrome With Opacity

Purpose	Validate monochrome plus opacity format and correct decompression and assemble the tiles.
Source Image	Image 6.
Successful Read Test Results	Image appears correct. Correct resolution is retrieved. Tiles are correctly assembled.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

3.3 Part 2: Viewing Parameters

This section of the Test Suite allows you to test the following image manipulation and rendering features.

Testing of Views

- Source and Result image view displays.
- Viewing Parameters, reading of cached and non-cached images through their views.

Spatial Testing

- Simple Spatial transforms.
- Demonstrates characteristics of an implementation's choices of decimation filters and interpolation methods (most noticeable with spatially- transformed images.)

Testing of ColorTwists

- Apply Colortwist matrix against normalized PhotoYCC.
- Tint a monochrome image (treat data as RGB for this colortwist).
- Colortwisting NIFRGB (combine colortwist matrix with matrices to convert back and forth to NIFRGB).
- Cascading color space conversion matrices with colortwist matrix into one operation. Reapplying to another matrix for output color space.
- Management to and from the required RGB color space for the contrast adjustment.
- Testing of Sharpen and Blur filters.

Write Tests

Write tests ensure the implementation's ability to generated valid *FlashPix* files.

3.3.1 Transforms With Results Not Cached

Purpose of Tests

- Test read/write of source images with viewing parameter(s). Not cached.
- Demonstrates how ROI is not a crop.
- Demonstrates rotation with and without scaling and translating the image.

Successful Completion of Read Test

- Generally, viewing transforms are recognized.
- Optional core *FlashPix* View streams do not negatively affect functionality.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Any warning messages returned by the Verifier should be closely examined.

TEST 1

Simple View

Purpose	Validate handling of simplest view transform.
Source Image	Image 7. NIFRGB image with transform: rectangle of interest.
Successful Read Test Results	Image appears correct, and matches TIFF image. ROI is set to the top left corner of the image, maintaining an aspect ratio of 1.5. At a minimum, the square of the partial image should appear in the top left corner and either the background color or black must appear in the rest of the image area, depending upon compositing or display choices. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 2

Simple Spatial Operation

Purpose	Validate handling of simple spatial affines within an RGB with opacity and compressed image.
Source Image	Image 8. NIFRGB image with ROI transform.
Successful Read Test Results	Image appears correct, and matches TIFF image. ROI is set to the top left corner of the image, maintaining an aspect ratio of 1.5. At a minimum, the square of the partial image should appear in the top left corner and either the background color or black must appear in the rest of the image area, depending upon compositing or display choices. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 3**Rotation**

Purpose	Validate handling of a spatial affine within an RGB and compressed image.
Source Image	Image 9A. NIFRGB image with transform: rotate 30 degrees about center.
Successful Read Test Results	Image is cropped. Image appears correct, and matches TIFF image. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 4**Multiple Spatial Transforms**

Purpose	Validate handling of multiple spatial affines within an RGB and compressed image.
Source Image	Image 9B. A NIFRGB image with transform: Scale and translate affines and rotate 30 degrees about center.
Successful Read Test Results	Entire image is visible and appears correct. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 5

Horizontal Skew

Purpose	Validate skew affine in a RGB compressed image.
Source Image	Image 11A. A NIFRGB image with transform: Horizontal skew 25 about center; scale and translate.
Successful Read Test Results	Image appears correct. Correct resolution is retrieved. Tiles are correctly assembled into an image. Pay close attention to any edge artifacts which implementation algorithms may expose. Examine edges closely.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 6

Vertical Skew

Purpose	Validate skew affine in a RGB compressed image.
Source Image	Image 11B. A NIFRGB image with transform: Vertical skew 25 about center; scale and translate.
Successful Read Test Results	Image appears correct. Correct resolution is retrieved. Tiles correctly assembled into an image. Pay close attention to any edge artifacts which implementation algorithms may expose. Examine edges closely.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 7

Rotate and Contrast (Monochrome)

Purpose	Validate handling of rotate affine with contrast within an uncompressed monochrome image.
Source Image	Image 15. A monochrome image with transform: scale, translate, and rotate about (0,0) with contrast.
Successful Read Test Results	Image appears correct, and matches TIFF image. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 8

Multiple Spatial, Severe Contrast

Purpose	Validate handling of multiple spatial transforms with transforms with contrast within a NIFRGB image.
Source Image	Image 16.
Successful Read	Image appears correct, and matches TIFF image. Contrast appears severe.
Successful Write	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 9

Skew With Colortwist PhotoYCC

Purpose	Validate handling of skew affine with colortwist within a PhotoYCC with opacity and compressed image.
Source Image	Image 17. A PhotoYCC image with opacity, compressed, with transform: horizontal skew 25 and colortwist: heavy green adjustment; scale and translate.
Successful Read Test Results	Image matches TIFF image (very green). Correct resolution is retrieved. Tiles are correctly assembled.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 10

Simple Filtering: Sharpen +5

Purpose	Validate simple sharpen filter with an RGB image. Continue with consecutive reads of 18 B, 18C, and 18D for comparison.
Source Image	Image 18A. NIFRGB uncompressed; filter +5 (Sharpen).
Successful Read Test Results	Image appears correct, matches TIFF image, and is sharper than baseline. (Compare with image set 9 as a Sharpen = 0 baseline). Correct resolution is retrieved. Tiles are correctly assembled.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 11**Simple Filtering: Sharpen +10**

Purpose	Validate simple sharpen filter with an RGB image. Continue with consecutive reads of 18C, and 18D for comparison.
Source Image	Image 18B. NIFRGB uncompressed; filter +10 (Sharpen).
Successful Read Test Results	Image appears correct, matches TIFF image, and is less sharp than Image 18C. (Compare with image set 9 as a Sharpen = 0 baseline). Correct resolution is retrieved. Tiles are correctly assembled.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 12**Simple Filtering: Sharpen +15**

Purpose	Validate simple sharpen filter with an RGB image. Continue with consecutive reads of 18D for comparison.
Source Image	Image 18C. NIFRGB uncompressed; filter +15 (Sharpen).
Successful Read Test Results	Image appears correct, matches TIFF image, and is less sharp than Image 18D. (Compare with image set 9 as a Sharpen = 0 baseline). Correct resolution is retrieved. Tiles are correctly assembled.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 13

Simple Filtering: Sharpen +20

Purpose	Validate simple sharpen filter with an RGB image.
Source Image	Image 18D. NIFRGB uncompressed; filter +20 (Sharpen).
Successful Read Test Results	Image appears correct, matches TIFF image, and is sharper than Image 18C. (Compare with image set 9 as a Sharpen = 0 baseline). Correct resolution is retrieved. Tiles are correctly assembled.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 14

Simple Filtering: Blur -5

Purpose	Validate simple blur filter with an RGB image.
Source Image	Image 23A. NIFRGB uncompressed; filter -5 (Blur).
Successful Read	The blurriness of the image matches the TIFF image, and is less sharp than baseline. (Compare with image set 9 as a Sharpen = 0 baseline). However, any tile edge artifacts can be reduced by a different implementation of the blurring algorithm. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 15

Simple Filtering: Blur -10

Purpose	Validate simple blur filter with an RGB image.
Source Image	Image 23B. NIFRGB uncompressed; filter -10 (Blur).
Successful Read	The blurriness of the image matches the TIFF image, and is less sharp than Image 23A.(Compare with image set 9 as a Sharpen = 0 baseline). However, any tile edge artifacts can be reduced by a different implementation of the blurring algorithm. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 16

Simple Filtering: Blur -15

Purpose	Validate simple blur filter with an RGB image.
Source Image	Image 23C. NIFRGB uncompressed; filter -15 (Blur).
Successful Read	The blurriness of the image matches the TIFF image, and is less sharp than Image 23B.(Compare with image set 9 as a Sharpen = 0 baseline). However, any tile edge artifacts can be reduced by a different implementation of the blurring algorithm. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 17

Simple Filtering: Blur -20

Purpose	Validate simple blur filter with an RGB image.
Source Image	Image 23D. NIFRGB uncompressed; filter -20 (Blur).
Successful Read	The blurriness of the image matches the TIFF image, and is less sharp than Image 23C.(Compare with image set 9 as a Sharpen = 0 baseline). However, any tile edge artifacts can be reduced by a different implementation of the blurring algorithm. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 18

Complex Image with Severe Colortwist

Purpose	Validate read/write of a very complex image with severe blue colortwist
Source Image	Image 19.
Successful Read	Image appears correct, and matches TIFF image. Demonstrates characteristics of an implementation's choices of decimation filters and interpolation methods. These characteristics are most noticeable with spatially- transformed images.
Successful Write	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

3.3.2 Transforms With Results Cached

Purpose of Tests

- Test read/write of source images with viewing parameter(s). Results are cached.

Successful Completion of Read Test

- Generally, viewing transforms are recognized.
- Optional Core *FlashPix* View streams do not negatively affect functionality.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Any warning messages returned by the Verifier should be closely examined.

TEST 1

Cached Result

Purpose	Validate multiple spatial affines within an RGB plus opacity and compressed image; verify cached result.
Source Image	Image 10. A NIFRGB with opacity image with transform: Scale and translate affines and rotate 30 about (0,0); cached result.
Successful Read Test Results	Image appears correct, and matches TIFF image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 2

Skew With Colortwist

Purpose	Validate handling of skew affine with colortwist within an RGB with opacity and compressed image.
Source Image	Image 14. A NIFRGB with opacity, compressed; transform: horizontal skew 25 about (0,0) and colortwist: red adjustment; scale and translate. Cached result.
Successful Read Test Results	Image appears correct, and matches TIFF image. Correct resolution is retrieved. Tiles are correctly assembled into an image with transforms applied.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 3

Lightness

Purpose	Validate lightness affine in an RGB image.
Source Image	Image 20. NIFRGB uncompressed, w/ transform: colortwist: lighten.
Successful Read Test Results	Image appears correct, and matches TIFF image. Correct resolution is retrieved. Tiles are correctly assembled.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

3.3.3 Single Resolution *FlashPix* Files

Purpose

- Ability to read single resolution *FlashPix* files and write hierarchical images from them.

Successful Completion of Read Test

- Properties associated with single resolution *FlashPix* files can be read and critical properties can be correctly extracted.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Any warning messages returned by the Verifier should be closely examined.

TEST 1

Single Resolution File (Transformless 512 x 244 Pixels)

Purpose	Verify proper handling of simple, single resolution <i>FlashPix</i> files.
Source Image	Image 12A. RGB <i>FlashPix</i> file, NO thumbnail. Image dimensions are 512 x 244 pixels.
Successful Read Test Results	Image appears correct, and matches TIFF image. Viewer should handle lack of thumbnail without problems. Correct resolution is retrieved. Tiles are correctly assembled into an image.
Successful Write Test Results	The fully-propagated hierarchy of resolutions must be generated and this saved file must pass the Verifier. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	The fully-propagated hierarchy of resolutions must be generated and this saved file must pass the Verifier. Image saved is an accurate representation of the modified original image.

TEST 2

Single Resolution File (Transformless 756 x 504 Pixels)

Purpose	Verify proper handling of transformless simple-resolution <i>FlashPix</i> file.
Source Image	Image 12B. Single resolution <i>FlashPix</i> file (RGB), view - no transform, contains thumbnail. Image dimensions are 756 x 504.
Successful Read Test Results	Image appears correct, and matches TIFF image. Thumbnail can be read and displayed. Tiles are assembled into an image.
Successful Write Test Results	The fully-propagated hierarchy of resolutions must be generated and this saved file must pass the Verifier. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	The fully-propagated hierarchy of resolutions must be generated and this saved file must pass the Verifier. Image saved is an accurate representation of the modified original image.

TEST 3

Single Resolution File (With View)

Purpose	Verify read/write of single-resolution <i>FlashPix</i> file containing transform.
Source Image	Image 12C. Single resolution <i>FlashPix</i> file (RGB), w/transform: rotate 90 about (0,0), contains thumbnail. Image dimensions are 756 x 504.
Successful Read Test Results	Image appears correct, and matches TIFF image. and must be cropped. Thumbnail can be read and displayed. Tiles are assembled into an image.
Successful Write Test Results	The fully-propagated hierarchy of resolutions must be generated and this saved file must pass the Verifier. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	The fully-propagated hierarchy of resolutions must be generated and this saved file must pass the Verifier. Image saved is an accurate representation of the modified original image with transforms applied.

3.3.4 Single Color Compression and Mixed Compression Types

Purpose

Ability to read single-color compressed tiles, regardless of other compression types in a mixed-compression mode.

Successful Completion of Read Test

Presence of single-color compressed tiles does not affect core reader's ability to decode and assemble the tiles.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors.

TEST 1

Tiles Apart

Purpose	Validate NIFRGB color format and correctly decompress and assemble the tiles. Single-color compression is used in tiles 23 and 62 in the highest resolution.
Source Image	Image 21A.
Successful Read Test Results	Read each resolution, starting with the highest resolution. The image appears correct and matches the TIFF image. Rotate the image for each resolution. During the read of each resolution, ensure that the mixed compression types do not affect the color rotation.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 2**Tiles Together**

Purpose	Validate NIFRGB color format and decompress and assemble the tiles. Single-color compression is used in tiles 2 and 3 in the highest resolution.
Source Image	Image 21B.
Successful Read Test Results	Read each resolution, starting with the highest resolution. The image appears correct and matches the TIFF image. Rotate the image for each resolution. During the read of each resolution, ensure that the mixed compression types do not affect the color rotation.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 3**Many Single-Color Tiles (NIFRGB)**

Purpose	Validate NIFRGB color format and decompress and assemble the tiles, compression options, and table locations. Single-color compression in many tiles.
Source Image	Image 21C.
Successful Read Test Results	Read each resolution, starting with the highest resolution. The image appears correct and matches the TIFF image. Rotate the image for each resolution. During the read of each resolution, ensure that the mixed compression types do not affect the color rotation.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 4**Many Single-Color Tiles (PhotoYCC)**

Purpose	Validate PhotoYCC color format and correctly decompress and assemble the tiles, compression options, and table locations. Single-color Compression is used in many tiles.
Source Image	Image 21D.
Successful Read Test Results	Read each resolution, starting with the highest resolution. The image appears correct and matches the TIFF image. Rotate the image for each resolution. During the read of each resolution, ensure that the mixed compression types do not affect the color rotation.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

TEST 5**All One Color**

Purpose	Validate NIFRGB color format and correctly decompress and assemble the tiles, compression options, and table locations. Single-color Compression is used for most tiles.
Source Image	Image 21E.
Successful Read Test Results	Read each resolution, starting with the highest resolution. The image appears correct and matches the TIFF image. Rotate the image for each resolution. During the read of each resolution, ensure that the mixed compression types do not affect the color rotation.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with transforms applied.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with transforms applied.

3.3.5 ICC Profiles

Purpose

Test read/write of source image with optional ICC Profile streams.

Successful Completion of Read Test

If the implementation supports obtaining ICC data, verify that the contents of the profile have been correctly retrieved.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors.

TEST 1

NIFRGB with ICC Profile

Purpose	Validate read/write of NIFRGB with ICC Profile stream.
Source Image	Image 22A.
Successful Read Test Results	Image appears correct. If your implementation supports reading ICC profiles, they are retrieved successfully.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

TEST 2

PhotoYCC with ICC Profile

Purpose	Validate read/write of PhotoYCC with ICC Profile stream.
Source Image	Image 22B.
Successful Read Test Results	Image appears correct. If your implementation supports reading ICC profiles, they are retrieved successfully.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image.

3.3.6 Extension List Persistence

Purpose

Tests ability to read images containing extension lists.

Successful Completion of Read Test

Additional streams, storages, and properties do not negatively affect core readers.

Successful Completion of Write Tests

You must use the Verifier utility to test whether a *FlashPix* file you have written (saved, saved as, or copied) conforms to the *FlashPix* core definition. A file meets the *FlashPix* core definition if it passes the Verifier test without errors. Extension List persistence rules are followed during a write operation.

TEST 1

Extension List (PhotoYCC)

Purpose	Validate read/write of images containing private extensions (or simulated registered extensions.)
Source Image	Image 24A. Image contains two simulated registered extension streams.
Successful Read Test Results	Image appears correct, and matches TIFF image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with any existing transforms applied. The extension data elements and all properties in the Extension List Property Set must be retained.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with any existing transforms applied. The extension data elements and all properties in the Extension List Property Set will be retained in accordance with the Extension Persistence Property.

TEST 2

Extension List (NIFRGB)

Purpose	Validate read/write of images containing simulated registered extensions.
Source Image	Image 24B. Image contains extra storages, property sets, and properties.
Successful Read Test Results	Image appears correct, and matches TIFF image.
Successful Write Test Results	Passes Verifier test without errors. Image saved is an accurate representation of the original image with any existing transforms applied. The extension data elements and all properties in the Extension List Property Set must be retained.
Successful Write of Modified Image	Passes Verifier test without errors. Image saved is an accurate representation of the modified original image with any existing transforms applied. The extension data elements and all properties in the Extension List Property Set will be retained in accordance with the Extension Persistence Property.

APPENDIX *Test Images*

A

A.1 Introduction

This appendix describes the test images supplied with the Test Suite. These images are the data source for the Test Suite scenarios, and are representative of the key features of the *FlashPix* core Specification.

The Test Suite is used in conjunction with these test images to test *FlashPix* Writers, Readers, and Viewers. The suite is a compilation of scenarios, images, verification tools, viewing tools and some analysis tools to assist in debugging.

A.1.1 Image Contents

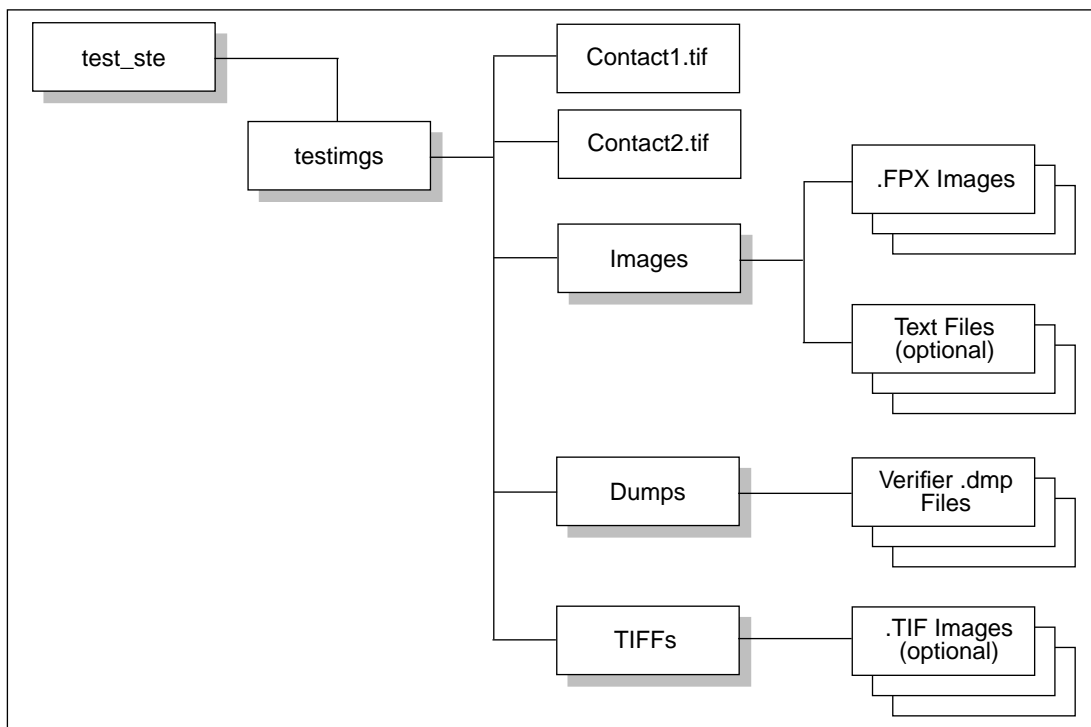
The images are assembled into sets which contain the most likely permutations of images and views which are to be written. Each set addresses the testing of specific targeted features. They increase in complexity as optional properties, viewing parameters and transforms are added. The sets are comprised of transformless *FlashPix* image views, single-resolution *FlashPix* files, and transformed images defined by the *FlashPix* core specification.

The image content itself has been carefully assembled so that the many images are useful in their own right. Each image, regardless of the set to which it belongs, contains its own “challenge”, such as a varied compressed scheme, a different color space, addition of an opacity channel, and so on.

A.1.2 Accessing the Image Collections

The following illustration shows the structure of the test image directories as they appear on the CD. File locations may differ if you are accessing them via the internet.

FIGURE A.1 Directory Structure of *FlashPix* Test Image



The contents of these directories are described below:

- Contact Sheets
The contact sheets (contact1.tif, contact2.tif) are located under the *testings* directory. They contain small representations of the test images. Display or print these files as a reference.
- Images Directory
The *images* directory contains two types of files: the *FlashPix* test files (.FPX), and optional ASCII text files (.TXT) which supply additional information if needed.
- TIFF directory
The *TIFF* directory contains optional TIFF files (.TIF), which serve as representations of the *FlashPix* images after transforms have been correctly applied.
- Dump directory
The *Dump* directory contains Verifier dumps of the test images. The ASCII dump files (.DMP) list the core storages, streams, and Property Sets for a *FlashPix* image.

A.2 Test Image Matrix

The table shown on the following pages describes the test images for use with the Interoperability Test Suite. The image number and description are shown in the leftmost column of the matrix, followed by the image name as it appears on the contact sheet.

Notes:

- Specific affine values for each image are documented in the Verifier dump file associated with the image; the dump file is located in the same directory as the image.
- Unless otherwise specified, compression factors for each image are chosen at random.
- Unless otherwise indicated, colors are rotated to yCrCb internally to JPEG for compressed RGB images.
- Compression percentages in the matrix refer to the Quality level of compression.
- Because the spatial transforms are defined to be applied against the destination, they are inverse. (Positive rotation is represented as counter-clockwise). For example, when a rotation r is specified, the visual effect is $360-r$. Therefore, a rotation of 90 in the appendix should render visually as 270.

TABLE A.1

FlashPix Interoperability Test Images

Image Identification		Image Content			FPX Attributes and Options			
Image Number and Description	Contact Sheet Name	Number of Resolutions	Number of Channels	Color Space	Compression Level	Viewing Parameters and Transforms	Cached Result	Options and Comments
Image 1A: Transformless	pxtr2	5	3	NIFRGB	None	None	N/A	Summary Info Codepage=1200
Image 1B: Transformless	pxtr2	5	3	NIFRGB	95 % compression for all resolutions ; No embedded tables	None	N/A	Summary Info Codepage=1200
Image 1D: Transformless	pxtr2	5	3	NIFRGB	95% ; No embedded tables; No color rotation internal to JPEG	None	N/A	Summary Info Codepage=1200 JPEG default override
Image 2A: Transformless	pxtr2	5	4	NIFRGB + opacity	None	None	N/A	Summary Info Codepage=1200
Image 2B: Transformless	pxtr2	5	4	NIFRGB + opacity	90% ; No embedded tables	None	N/A	Summary Info Codepage=1200
Image 2D: Transformless	pxtr2	5	4	NIFRGB + opacity	90% ; Embedded tables	None	N/A	Summary Info Codepage=1200
Image 2E: Transformless	pxtr2	5	4	NIFRGB + opacity	90% ; Embedded tables	None	N/A	Summary Info Codepage=1200 uncalibrated bits set
Image 3A: Transformless	pxtr2	6	3	PhotoYCC	None	None	N/A	Summary Info Codepage=1200
Image 3B: Transformless	pxtr2	6	3	PhotoYCC	80% ; No embedded tables	None	N/A	Summary Info Codepage=1200

Image Identification		Image Content				FPX Attributes and Options			
Image Number and Description	Contact Sheet Name	Number of Resolutions	Number of Channels	Color Space	Compression Level	Viewing Parameters and Transforms	Cached Result	Options and Comments	
Image 3C: Transformless	pxtry	6	3	PhotoYCC	PWV compression: 2 highest resolutions compressed 90%: Lower resolutions not compressed	None	N/A	Non-image data present	
Image 4: Transformless	redhat	5	4	PhotoYCC + opacity	75%; embedded tables	None	N/A		
Image 5: Transformless	lake	5	1	Mono	None	None	N/A		
Image 6: Transformless	lake	5	2	Mono + opacity	75% compression; No embedded tables	None	N/A		
Image 7: Simple transform	plaza	5	3	NIFRGB	None	ROI	No		
Image 8: Simple transform	plaza	5	4	NIFRGB + opacity	88% compression; No embedded tables	ROI	No		
Image 9A: Spatial transforms; One affine	town	5	3	NIFRGB	72% compression; No embedded tables	Rotate 30 about center	No		
Image 9B: Spatial transforms; One affine	town	5	3	NIFRGB	72% compression; No embedded tables	Scale: Translate Rotate 30 about the center	No	Same as 9A	
Image 10: Multiple transforms; One affine	plaza	5	4	NIFRGB + opacity	75% compression; Embedded tables	Scale: Translate; Rotate 30 about (0.0)	Yes		
Image 11A: Square; Skew transform	door	4	3	NIFRGB	75% compression; No embedded tables	Scale: Translate; Horizontal skew 25 degrees	No		
Image 11B: Vertical skew	door	4	3	NIFRGB	75% compression; No embedded tables	Scale: Translate; Vertical skew 25 degrees	No	Same as 11A	

Image Identification			Image Content				FPX Attributes and Options			
Image Number and Description	Contact Sheet Name	Number of Resolutions	Number of Channels	Color Space	Compression Level	Viewing Parameters and Transforms	Cached Result	Options and Comments		
Image 12A: Single resolution, transformless	plaza	1 Original size 512x244	3	NIFRGB	None	None	No	Possible Digital capture; No thumbnail		
Image 12B: Single resolution, transformless	plaza	1 Original size 756x504	3	NIFRGB	None	None	No	Possible Digital capture		
Image 12C: Single resolution with transform	plaza	1	3	NIFRGB	None	Rotate 90 degrees about the center	No	Possible digital capture options same as 12B		
Image 14: Square, multiple transforms	door	4	4	NIFRGB + opacity	No embedded tables	Horizontal skew; Color twist red adjustment	Yes			
Image 15: 1 affine with multiple operations	lake	5	1	Mono	None	Scale: Translate; Rotate 30 about (0,0); Contrast	No			
Image 16: 1 affine with multiple operations; Compressed	lake	5	3	NIFRGB	80% compression; No embedded tables	Scale: Translate; Rotate 30 about (0,0); Contrast	No	Non-image data present		
Image 17: Square; Skew with colortwist	door	4	4	PhotoYCC + opacity	80% compression; No embedded tables	Horizontal skew 25; Heavy colortwist green adjust	No			
Image 18A: Sharpen filter	town	5	3	NIFRGB	None	Sharpen +5	No			
Image 18B: Sharpen filter	town	5	3	NIFRGB	None	Sharpen +10	No			
Image 18C: Sharpen filter	town	5	3	NIFRGB	None	Sharpen +15	No			
Image 18D: Sharpen filter	town	5	3	NIFRGB	None	Sharpen +20	No			

Image Identification		Image Content			FPX Attributes and Options			
Image Number and Description	Contact Sheet Name	Number of Resolutions	Number of Channels	Color Space	Compression Level	Viewing Parameters and Transforms	Cached Result	Options and Comments
Image 19: Multiple spatial operations; Sharpen	town	5	3	NIFRGB	None	ROI: Rotate 30 about (0,0); Vertical shear 25; Colortwist blue; Contrast ; Filter	No	
Image 20: Lightness adjust; Cached	dwin	5	3	NIFRGB	None	Colortwist red and blue adjustment; Added Lightness; Desaturated	Yes	
Image 21A: Single color compression	Tiles Apart	6	3	NIFRGB	Single color compression - single tiles apart; Rest 90% compression	None	No	
Image 21B: Single color compression	Tiles Together	5	3	NIFRGB	Single color compression - single tiles together; Rest 90% compression	None	No	
Image 21C: Single color compression	Txt on Gray	6	3	NIFRGB	Single color compression - many single tiles; Rest 90% compression	None	No	
Image 21D: Single color compression	Txt on Gray	6	3	PhotoYCC	Single color compression - many single tiles; Rest 90% compression	None	No	
Image 21E: Single color compression	One Color	5	3	NIFRGB	Single color compression - many single tiles; Rest 90% compression	None	No	
Image 22A: ICC profile	door	4	3	NIFRGB	None	None	No	NIFRGB ICC profile
Image 22B: ICC profile	door	4	3	PhotoYCC	None	None	No	PhotoYCC ICC profile

Image Identification		Image Content			FPX Attributes and Options			
Image Number and Description	Contact Sheet Name	Number of Resolutions	Number of Channels	Color Space	Compression Level	Viewing Parameters and Transforms	Cached Result	Options and Comments
Image 23A: Blur Filter	town	5	3	NIFRRGB	None	Blur -5	No	
Image 23B: Blur Filter	town	5	3	NIFRRGB	None	Blur -10	No	
Image 23C: Blur Filter	town	5	3	NIFRRGB	None	Blur -15	No	
Image 23D: Blur Filter	town	5	3	NIFRRGB	None	Blur -20	No	
Image 24A: Extension List	door	4	3	PhotoYCC	Compression	None	No	2 private streams - one persistent; one not persistent
Image 24B: Square; Skew transform Extensions	door	4	3	NIFRRGB	75% compression; No embedded tables	Scale: Translate; Horizontal skew 25 degrees	No	Many extensions

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